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NRC·CNRC

2011-12
Estimates

Part III: Report on Plans and Priorities (RPP)

National Research Council Canada

The Honourable Christian Paradis
Minister of Industry and Minister of State (Agriculture)

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Minister of Industry's Message

As Canada's economy shows continued signs of growth following the global recession, the Harper government has a clear vision for Canada. We remain focused on creating jobs and economic growth in all regions of Canada. We remain committed to fighting protectionism, the number one impediment to global economic recovery. And we will continue to support science and technology as it drives innovation to improve quality of life for Canadians.

In the coming year, Industry Canada and its portfolio partners will seize the opportunities of the evolving global economy. We will set the conditions for industrial success by improving the policy we put in place, making strategic investments and supporting business-focused programs and services. We are working to remove impediments to competition and to create the best climate for international investment. Industry Canada will lead efforts in developing major policy initiatives to support Canada's digital economy and shape a whole-of-government strategy for federal tourism activities. The Department will also improve the cost-effectiveness and efficiency of its own operations and work with recovering industries and sectors to help assure a solid and prosperous future.

In 2011-12, the National Research Council Canada (NRC) will support federal priorities to increase innovation and productivity for sustainable, long-term economic growth. The NRC's aim is to bring timely technological solutions to the marketplace, in partnership with its clients, in areas of national importance such as health care, natural resources and climate change. The NRC will continue to stimulate the innovation activities of small to medium-sized businesses and collaborate with Canadian firms to develop and deploy technologies and market-oriented results.

And, as always, I will work with the Industry portfolio partners, the private sector and other governments to create the fundamentals for a strong and competitive economy.

It is my pleasure to present this year's Report on Plans and Priorities for the National Research Council Canada.

Christian Paradis
Minister of Industry and Minister of State (Agriculture)

Minister of State's Message

As Minister of State for Science and Technology, it is my pleasure to present this year's Report on Plans and Priorities for the National Research Council Canada.

The economy remains our government's top priority. As Canada is still recovering from the global recession, we are focused on creating jobs and economic growth.

This is why we are supporting promising new research as part of Canada's Economic Action Plan: to create jobs, strengthen our economy and improve Canadians' quality of life.

Science is key to Canada's future economic growth. To remain at the forefront of the global economy, we must invest in the people and ideas that will produce tomorrow's breakthroughs.

Our investments through the National Research Council are helping Canada develop, attract and retain the world's best and brightest researchers. As a result, our country is strengthening its position as a leading destination for the world's top research talent.

In the four years since Prime Minister Harper launched the Government of Canada's science and technology strategy, we have achieved a great deal, for which we as Canadians can be proud.

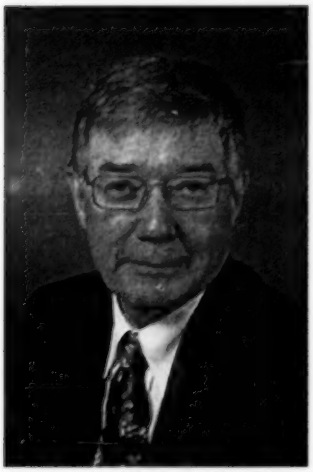
From Iqaluit in the Far North to rural Saskatchewan, from Victoria to St. John's and from Quebec's Eastern Townships to Northern Ontario, there are thousands of researchers pursuing some of the most important questions of our time – all with the support and encouragement of the Government of Canada. Indeed, it is through the vital and ongoing efforts of organizations such as the National Research Council Canada that these Canadian researchers will remain on the leading edge of science and innovation for years to come.

Throughout 2010–11, I have seen first-hand the impact that the National Research Council is having on Canada. From support for entrepreneurship in Canadian small and medium-sized businesses through the Industrial Research Assistance Program to the outcomes of successful research and development partnerships, the National Research Council Canada is focused on bringing new products, processes and technologies to the marketplace for the benefit of Canadians. I am proud of the work that the National Research Council Canada has done, and I am looking forward to 2011–12.

This work, however, requires the ongoing engagement and support of our many stakeholders. As we move into 2011–12, I will continue to liaise with our university partners, the private sector and all Canadians to achieve the priorities laid out in this report.

Gary Goodyear
Minister of State (Science and Technology)

President's Message



Mr. John McDougall, President

The federal government is committed to building a competitive advantage for Canada with science, technology and innovation playing key roles. As Canada's federal research and technology organization, the National Research Council Canada is aligned with this commitment, having plans and priorities to build national strengths in areas of socio-economic importance to Canadians.

I was appointed to lead the National Research Council in April 2010. I am very proud to present my first Report on Plans and Priorities for tabling in Parliament.

In 2011-12, NRC will embark upon a new strategy with an outlook to 2031. NRC intends to more sharply focus its resources on key areas where Canada can be world-class and contribute to improving competitiveness and productivity. The end goal will be to enhance our country's innovation performance in support of our vibrant and prosperous society.

One of our core values is collaboration and partnerships. The coming year will see a strong emphasis on growing relationships across the country and around the world, such as building upon the recent success of the Canada-Israel summit in Toronto in 2010. Addressing some of the biggest challenges in healthcare, the environment, energy and information and communication technologies will require coordinated and collaborative efforts across governments, private industry, not-for-profits, and academia. As part of this coordinated effort, NRC will lead and participate in key federal S&T priority areas by developing and deploying value-added technology, by helping industry to grow its competitive edge in the global marketplace, and by addressing innovation challenges.

To support federal initiatives in cost-effectiveness and efficiency in 2011-12, we are also working on financial and management plans to strengthen decision-making processes, operational efficiencies, and long-term measures for sustainability. Ensuring effective and efficient leadership will enable NRC to realize success against its goals while investing public funds wisely.

Section I – Overview

1.1 Summary Information

1.1.1 Raison d'être and Responsibilities

The National Research Council Canada (NRC) bridges the innovation gap between early stage research and development (R&D) and commercialization, focusing on socio-economic benefits for Canadians and increasing national performance in innovation. A federal leader in technology development, NRC supports the business sector in Canada to enhance innovation capabilities and capacity and become more productive in the development and deployment of innovative products, processes and services for targeted markets. With a presence in every province, NRC combines a strong national foundation with international linkages to help Canada grow in productivity and remain globally competitive. To ensure a multi-disciplinary and integrated approach, NRC works in collaboration with industry, governments, and academia.

NRC is transitioning to a new strategy in 2011. This strategy forms the basis of plans and priorities for 2011-12 and beyond, and drives strategic focus in areas where NRC can make unique and compelling contributions:

- Developing and deploying leading-edge technology in areas of national priority to support sustainable domestic prosperity;
- Fostering industrial, community, and small and medium-sized enterprises (SMEs) innovation, growth, and productivity through targeted support;
- Managing large national research infrastructure and facilities for the scientific and industrial sectors to help push innovation forward and keep Canada at the cutting-edge.

NRC's strategic intent is founded upon a vision and mission designed to support federal science and technology (S&T) priorities.

NRC VISION

To be the most effective research and technology organization in the world, stimulating sustainable domestic prosperity.

NRC MISSION

Working with clients and partners, we provide strategic research, scientific and technical services to develop and deploy solutions to meet Canada's current and future industrial and societal needs.

NRC's success will ultimately be measured by the extent to which it is helping to build a globally competitive and prosperous Canada. NRC plans and priorities intend to generate long-term value in areas of importance to Canada by contributing to the following impact areas for our clients:

- Increased business enterprise expenditures on R&D (BERD);
- Technology commercialization; and
- High-quality job creation.

NRC MANDATE

Under the [1] *National Research Council Act*, NRC is responsible for:

- Undertaking, assisting or promoting scientific and industrial research in fields of importance to Canada;
- Providing vital scientific and technological services to the research and industrial communities;
- Investigating standards and methods of measurement;
- Working on the standardization and certification of scientific and technical apparatus and instruments and materials used or usable by Canadian industry;
- Operating and administering any astronomical observatories established or maintained by the Government of Canada;
- Establishing, operating and maintaining a national science library; and
- Publishing and selling or otherwise distributing such scientific and technical information as the Council deems necessary.

1.1.2 NRC Accountability Framework

NRC is a departmental corporation of the Government of Canada, reporting to Parliament through the Minister of Industry. NRC works in partnership with members of the Industry Portfolio to leverage complementary resources to promote the innovation of firms, to exploit synergies in key areas of S&T, to promote the growth of SMEs, and to contribute to the economic growth of Canadian communities. The government-appointed members of the NRC Council provide independent strategic direction and advice to the President and reviews organizational performance. The President provides leadership and strategic management and is responsible for the achievement of NRC's long-range goals and plans within the guidance of the NRC Council. Each of seven Vice Presidents is responsible for a portfolio of program activities composed of research institutes, initiatives, centres and/or a corporate branch. Beneath senior management, 26 Directors General and various committees are responsible for executing against plans and priorities to ensure successful achievement of objectives.

1.1.3 NRC Strategic Outcomes and 2011-12 Program Activity Architecture (PAA)

To fulfill its mandate, NRC's programs are aligned to achieve two Strategic Outcomes:

1. Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas.

2. Canadians have access to research and development information and infrastructure.

NRC's program activities directly support these strategic outcomes. NRC's current PAA, shown below, illustrates how activities are organized to achieve these desired results.

NRC's current PAA has been crosswalked to the new NRC strategy and is aligned with Government of Canada's Strategic Outcomes and federal priorities. As such, no major changes are anticipated for the immediate future. As NRC's new strategy is implemented, the NRC PAA will be reviewed to ensure continued alignment and contribution towards Canada's Strategic Outcomes.

Canadian Strategic Outcome	NRC Strategic Outcome	NRC Program Activity[1]	NRC Sub-Activity
Strong Economic Growth	Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas	Manufacturing Technologies	• Aerospace Research • Construction Research and Support • Manufacturing and Materials Research • Surface Transportation Technology
		Information and Communications Technologies and Emerging Technologies	• Semiconductor-Based Technology Research • Information Technology Research • Nanotechnology Research • Molecular Sciences Research
		Industrial Research Assistance	
Healthy Canadians		Health and Life Science Technologies	• Health and Environmental Biotechnology Research • Age-Related and Infectious Disease Research • Medical Diagnostic Technology Research • Marine Biosciences and Nutrisciences Research • Plant Biotechnology Research • Genomics and Health Technology
Clean and Healthy Environment		Energy and Environmental Technologies	• Ocean Technology Research • Sustainable Energy Technologies and Environmental Monitoring Research • Fuel Cells Technology Research • Hydraulics Technology Research
Innovative and Knowledge-Based Economy	Canadians have access to research and development information and infrastructure	National Science and Technology Infrastructure	• National Measurement Standards • Canadian Astronomical Observatories • Facility for Sub-Atomic Research TRIUMF • Canadian Neutron Beam Centre
		Scientific, Technical and Medical Information	

1.2 Planning Summary

1.2.1 Financial and Human Resources

Financial Resources	2011-12	2012-13	2013-14
($ millions)	690.836	618.567[2]	622.407

For an explanation of the annual variation in spending, please refer to the discussion of the spending trend in the Expenditure Profile subsection.

[1] Internal services not shown.

[2] The $72M difference in planned spending between FY11-12 to FY12-13 is largely due to the sunsetting of Technology Cluster Initiatives ($66.7M, up for renewal in March 2012) and anticipated savings in collective agreements ($4.1M).

Human Resources	2011-12	2012-13	2013-14
Full-Time Equivalents (FTEs)[3]	3,743	3,375[4]	3,375

1.2.2 Planning Summary by Strategic Outcome

NRC Strategic Outcome 1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas

Performance Indicator(s)	Target(s)[5]
Average incremental number of new and improved client products as a result of NRC's R&D activities compared to non-clients	0.6 by March 2012
Average incremental client R&D expenditures as a result of NRC's R&D activities compared to non-clients	$75,000 by March 2012
Average incremental client R&D full-time equivalents employed as a result of NRC's R&D activities compared to non-clients	1.2 by March 2012

[2] Program Activity	Forecast Spending ($ millions)	Planned Spending[6] ($ millions)			[3] Alignment to Government of Canada Outcomes
	2010-11	2011-12	2012-13	2013-14	
Manufacturing Technologies	127.789	126.551	111.916	112.174	Strong Economic Growth
ICT and Emerging Technologies	77.183	69.534	40.223	40.364	Strong Economic Growth
Industrial Research Assistance	290.850	139.146	134.013	134.601	Strong Economic Growth
Health and Life Science Technologies	114.117	92.829	81.652	82.172	Healthy Canadians
Energy and Environmental Technologies	35.746	34.633	27.995	28.137	Clean and Healthy Environment
Total	**645.685**	**462.693[7]**	**395.799[8]**	**397.448**	

NRC Strategic Outcome 2: Canadians have access to research and development information and infrastructure

Performance Indicator(s)	Target(s)
Proportion of surveyed S&T infrastructure users who report positively on the value of the NRC infrastructure used	85% by March 2012

[3] All FTEs are forecasted based on personnel cost planning as at December 2010, unless otherwise noted.
[4] The difference between FY11-12 and FY12-13 is largely due to the sunsetting of Technology Cluster Initiatives, which is up for renewal in March 2012.
[5] All targets are cumulative relative to April 2010, unless otherwise presented (ratios, for example).
[6] Planned spending reflects best estimates of spending to year end.
[7] The $183M difference between FY10-11 and FY11-12 is largely due to Canada's Economic Action Plan initiatives, which will be completed by March 31, 2011 ($145M). The remaining difference is due to a forecast reduction in Genomics Research & Development Initiative ($6M for NRC through a reallocation within the Initiative envelope) and the Indoor Air Initiative ($2M), and a variety of factors such as government-wide budget management measures ($1.1M), anticipated revenue decline from spinoff of the NRC Research Press ($5.9M), and anticipated internally-realized budget management measures ($21.3M).
[8] The difference in planned spending from FY11-12 to FY12-13 is due to the sunsetting of Technology Cluster Initiatives program ($66.7M), which is up for renewal in March 2012.

[4] Program Activity	Forecast Spending ($ millions)	Planned Spending ($ millions)			[5] Alignment to Government of Canada Outcomes
	2010-11	2011-12	2012-13	2013-14	
National Science and Technology Infrastructure	77.114	91.954	91.733	92.144	An Innovative and Knowledge-Based Economy
Scientific, Technical and Medical Information	38.543	13.209[9]	13.080	13.253	An Innovative and Knowledge-Based Economy
Total	**115.657**	**105.163**	**104.813**	**105.397**	

[6] Program Activity	Forecast Spending ($ millions)	Planned Spending ($ millions)			[7] Alignment to Government of Canada Outcomes
	2010-11	2011-12	2012-13	2013-14	
Internal Services	139.431	122.980[10]	117.954	119.561	N/A

1.2.3 Contribution of NRC Priorities to Strategic Outcomes

The Government of Canada (GoC) recognizes the far-reaching implications of innovation and that Canada can and must do more to turn ideas into solutions that will address substantial issues, such as rising health care costs and environmental sustainability to improve economic competitiveness. Innovation – the conversion of ideas and knowledge into commercially successful products and services – is a critical driver of increased productivity and domestic prosperity. In 2007, the Prime Minister announced [8] Canada's S&T Strategy, *Mobilizing Science and Technology to Canada's Advantage*, in recognition of the importance of innovation performance in building a sustainable, vibrant society. Through this Strategy, Canada is committed to make impacts in four S&T priority areas: Environmental Science and Technologies; Natural Resources and Energy; Health and Related Life Sciences and Technologies; and Information and Communications Technologies (ICT).

Since that time, the GoC has increased its support for S&T in many areas including infrastructure, training and attracting talent, and supporting scientific excellence. As a result, Canada's scientists perform at world-class levels and Canada attracts some of the best and brightest minds in many fields, leading the G7 in R&D performed in the higher-education sector as a percentage of gross domestic product (GDP). Despite these successes, there remains room to improve Canadian performance in innovation.

Enhancing Canadian innovation and sustaining a place in the top 10 of global innovation producers is of great importance to the GoC. This will require coordinated and collaborative efforts from governments, private industry, not-for-profits, and academia, to bridge gaps and remove barriers within the innovation system. As part of this coordinated effort, NRC will play a pivotal role by developing and deploying technology in S&T priority areas, by helping industry to grow its competitive edge in the global marketplace, and by addressing challenges in substantial national issues.

The key to our future will be for Canada to differentiate, not imitate. In 2011-12, NRC will focus its plans and priorities on building Canadian strengths in areas where it can make a difference.

Operational Priority 1: To foster business innovation and increase productivity of key industrial sectors, such as ICT, and to support the economic growth and development of communities across Canada.	**Type:** Ongoing	**Links to Strategic Outcome(s):** [7] SO1

[9] The difference between FY10-11 to FY11-12 is largely due to adjustments in follow up to Strategic Review.

[10] The difference between FY10-11 to FY11-12 is largely due to the completion of Canada's Economic Action Plan stimulus funding activities, including $10.36M for the Modernizing of Federal Labs and $2.4M for the Accelerated Federal Contaminated Sites Action Plan.

Why is this a priority?

- Canada's global competitiveness is currently lagging relative to traditional and emerging competitor nations, creating a challenge for long-term, sustainable productivity and prosperity.
- In its 2009 report on the state of innovation, the Conference Board of Canada gave Canada a D grade and ranked the nation 14 out of 17 countries.
- Canadian businesses that focus on R&D and technological achievement create high-quality, knowledge-intensive jobs.

Plans for meeting the priority

- NRC will provide targeted support and technical services to high-impact Canadian industries such as ICT, automotive, aerospace and construction. The focus for 2011-12 will be on emerging technologies that are increasing in prominence in our society and globally, such as green technologies for the manufacturing sector, smart buildings, and nano-science applications for key industries.
- NRC will continue to be located in regional technology clusters to stimulate growth and economic development, from a community and SME perspective. These clusters network with universities, governments, and industries to accelerate the commercialization of products and processes in key technology areas such as medical devices and photonics.
- NRC Industrial Research Assistance Program (NRC-IRAP) will improve operational efficiencies of program delivery in order to continue to provide advisory and funding support to Canadian SMEs in their R&D and innovation-related activities.

Operational Priority 2: To support and conduct R&D in areas of national importance such as energy, the environment, and health.	**Type:** Ongoing	**Links to Strategic Outcome(s):** SO1

Why is this a priority?

Economic growth, rising population levels, growing affluence, and urbanization are placing tremendous pressure on the worlds natural resources, the environment, and infrastructure. For example:

- World energy demand is expected to increase by 40 per cent by 2030. The energy sector plays a vital role in the Canadian economy, accounting for 5.6 per cent of the country's GDP and nearly 20 per cent of the total value of Canadian exports[11].
- Environmental impacts of climate change, such as drought affecting agriculture production, can have a significant negative impact on Canada's productivity, reducing GDP and costing jobs.
- Population growth, aging, and urbanization are expected to amplify health care pressures. Health care spending was estimated to be 11.7 per cent of the Canadian GDP in 2010, higher than it was in 2008, at 10.7 per cent[12].

Plans for meeting the priority

- To contribute to federal priorities in sustainable energy, NRC will contribute to the development of technologies to increase energy efficiency for industrial and residential facilities, convert biomaterials into clean energy, and store energy for sustainable transportation.
- To contribute to federal priorities in a clean environment, NRC will lead and participate in various horizontal activities, across NRC and in collaboration with government, academia and the private sector. Areas of focus are lighter materials for the aerospace and automotive industries, biofuels, green buildings, water quality, and sustainable agriculture.
- To contribute to federal priorities in health and wellness, NRC will work to advance technologies that focus on the early detection, prevention and treatment of various diseases, with a particular

[11] Statistics Canada, 2007.
[12] Canadian Institute for Health Information October 2010 annual report.

emphasis on addressing the needs of Canada's rapidly aging population.

Operational Priority 3: To provide integrated scientific support to enhance the generation and commercialization of knowledge.	**Type:** Ongoing	**Links to Strategic Outcome(s):** SO2

Why is this a priority?

- NRC has an integrated, multidisciplinary approach, and has identified opportunities where it can collaborate with other innovation system players to enhance Canada's capacity to generate and transform new knowledge into real economic value.

Plans for meeting the priority

- NRC will continue to provide access for Canadian user communities to an array of facilities, programs, and technology platforms designed to allow them to conduct leading-edge research, as well as to enable industry to take technology innovations to market.
- As Canada's national science library, NRC will enhance tools and services to provide Canada's innovation community with high-value information to support accelerated technology discovery, innovation, and commercialization.

Management Priority: To ensure effective program and organizational management for a sustainable organization.	**Type:** Ongoing	**Links to Strategic Outcome(s):** SO1 and SO2

Why is this a priority?

- Ensuring effective management will enable NRC to provide integrated research and technology solutions in areas of national importance.
- NRC must be a sustainable and agile national research and technology organization for Canada in order to achieve its strategic outcomes. NRC will ensure that there is clear and consistent corporate direction, and relevant program support to achieve its goals in alignment with federal S&T priorities.

Plans for meeting the priority

- NRC will implement the new NRC strategy and business models designed to meet the needs of targeted client segments.
- NRC will focus on human resource initiatives to attract and engage talent, plan for succession, and create a shared values system across NRC.
- NRC will focus on financial and management initiatives to strengthen decision-making and operational efficiencies, and to establish long-term measures for sustainability.
- NRC will explore client management initiatives that will enhance current and new relationships.
- NRC will work to fulfill Canadian priorities with targeted international economies by building beneficial relationships under Canada's S&T Agreements with other countries.
- NRC will focus on communication initiatives designed to raise public awareness of NRC and better relate to the needs of industry in Canada.

1.2.4 Risk Analysis

NRC's risk mitigation plan for 2011-12 will address the highest risks identified in the NRC Corporate Risk Profile (CRP). Specifically, key mitigation plans will focus on:

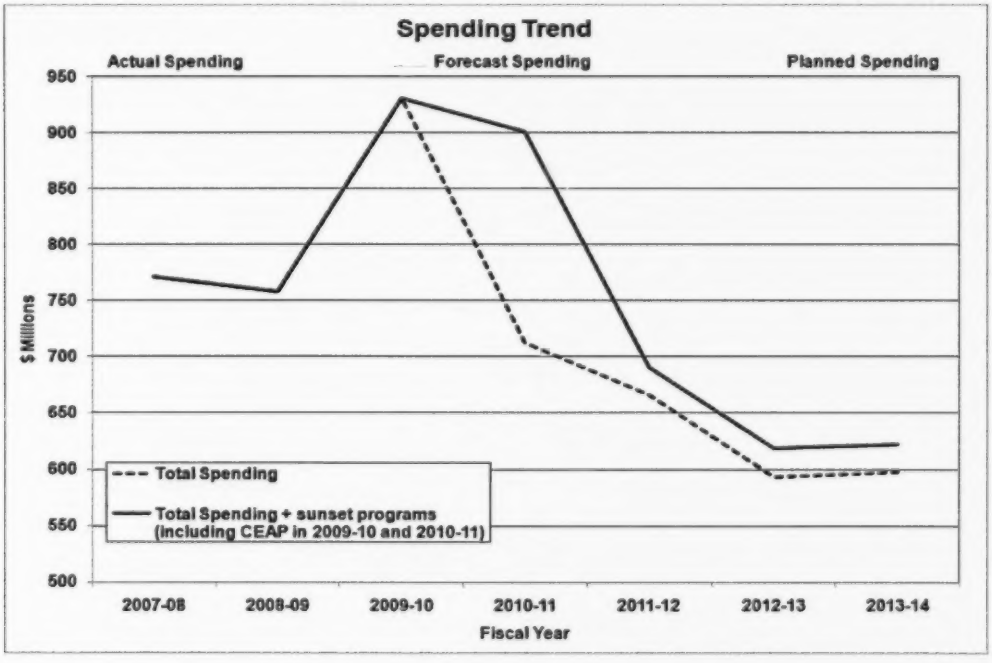
- *Focusing on Outcomes and Impacts.* NRC, NRC's clients, partners and collaborators face financial pressures in this time of economic uncertainty as we come out of the recent global recession. In response to this risk, NRC will be implementing specific initiatives for strengthened financial management and income generation strategies. In addition, the launch of NRC's new strategy will

focus programs and activities on outcomes and impacts with specified targets to ensure that resources are used in a cost-effective and efficient manner, leading to longer-term financial sustainability. Business processes will be streamlined and/or augmented accordingly to support program plans while helping to address significant issues around workload capacity and organizational agility.

- *Defining and Managing Change.* As NRC embarks on a new strategy in 2011, its culture, behaviours and mindset, supporting structures, governance, and practices will need to be aligned for effective implementation. NRC will ensure that the necessary changes will be well-defined with suitable plans in place to implement and manage those changes. Considerations for managing change will include review of and potential changes to business models, communication, governance, and individual and organizational competencies and capabilities. For example, organizational values were recently revised to reflect how employees, collectively, view today's NRC. The coming year will see initiatives in place to help employees across NRC live these values, which will be the foundation for successful change.
- *Building Leadership, Engagement and Highly Qualified Personnel.* It is becoming increasingly difficult to recruit high quality personnel (HQP) such as "star" scientists, while leadership succession and turnover rates suggest that essential leadership, management, and business skill sets and competencies risk being lost. In response to these risks, NRC will focus on building leadership capabilities and recruitment activities. Initiatives such as web-interactive online training tools and intensive, on-the-job leadership training through NRC's Leadership Enrichment and Development program support the development of NRC's current and future leaders, and provide opportunities for employees across NRC to build leadership management skills. NRC will also focus on enhancing and streamlining recruitment activities, resulting in specialized sourcing and recruitment expertise.

1.2.5 Expenditure Profile

NRC's forecast spending for 2010-11 is $900.7 million. Over the past three years (fiscal years 2007-08 to 2009-10), actual spending has averaged $820.0 million with Canada's Economic Action Plan (CEAP) and $773.3 million without CEAP. The planned spending for fiscal years 2011-12 to 2013-14, as indicated in the Spending Trend graph, reflects an overall decline in the budget. The decline is mainly due to the completion of initiatives funded under Canada's Economic Action Plan and the sunsetting of the Cluster Initiatives. The NRC will seek renewal of the Cluster Initiatives in March 2012 and until this is renewed, this item is not included in Planned Spending.



1.2.6 Estimates By Vote

For information on our organizational votes and/or statutory expenditures, please see the 2011–12 Main Estimates publication. An electronic version of the Main Estimates is available on [9] Treasury Board Secretariat's web site.

Section II – Analysis of Program Activities

2.1 NRC Strategic Outcome 1

Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas

The federal S&T Strategy commits to translating R&D into technology-driven products and services in national priority areas, as well as increasing the innovation capacity of industry in Canada. NRC's Strategic Outcome 1 is aligned to deliver on these commitments. To contribute to sustainable long-term economic growth, NRC seeks to develop and deploy technologies that target the innovation needs of Canadians and that grow regional communities. Research is translated into tangible solutions for industry to help create an attractive business environment, to maximize the contribution of key industry sectors to Canada's economy, and to support long-term prosperity. Resources are provided to help SMEs engage in research and development activities, and compete more effectively in world markets. Strategic Outcome 1 is also geared towards improving quality of life in specific priority areas – health and wellness, a clean environment, and the sustainable development of Canada's natural resources. In support of the federal S&T Strategy, NRC conducts its activities in collaboration with other government departments, academia and industry, acting where NRC makes unique and compelling contributions towards solutions in substantial issues that will benefit Canadians.

Descriptions for all program activities falling under this Strategic Outcome can be found on [10] Treasury Board Secretariat's web site.

Program Activity – Manufacturing Technologies					
Expected Result: Manufacturing industries in Canada have coordinated access to NRC's multidisciplinary research expertise and state-of-the art facilities to ensure they are at the leading edge of innovation					
Performance Indicator: Percentage of surveyed clients who report that NRC's manufacturing technologies research and facilities helped advance their innovation capacity			**Target:** 75% by March 2012		
Financial Resources ($ millions)			**Human Resources (Full-time Equivalents)**		
2011-12	**2012-13**	**2013-14**	**2011-12**	**2012-13**	**2013-14**
126.551	111.916[13]	112.174	984	924	924

Manufacturing industries play an important role in Canada's economy, contributing approximately 13 per cent to Canada's GDP[14]. However, recent economic stresses have taken a toll. In 2002, the sector employed more than 2.3 million Canadians but by September 2010, manufacturers had shed some 580,000 jobs, representing more than one in four manufacturing jobs. While the recent federal economic stimulus has proved beneficial, recovery remains fragile. To improve sustainable profitability, manufacturers must focus on reducing costs, increasing efficiencies, adopting new technologies, and complying with standards and regulations to respond to consumer expectations and preferences. Developing and adopting

[13] The difference between FY11-12 and FY12-13 is due to the Technology Clusters Initiative program, which is up for renewal in March 2012.
[14] Statistics Canada, as a percentage of 2009 GDP total.

innovation advantages is widely recognized as the key to ensuring global competitiveness that will contribute to Canada's productivity and job creation.

NRC's expertise and world-class competencies in the areas of aerospace, automotive and construction enable it to provide targeted support and services to these high-impact industry sectors. These technology intensive sectors depend on innovation for their growth and competitiveness, thus benefiting from the resources and knowledge provided by NRC. Activities at NRC are managed in a comprehensive way to ensure that scientific and engineering capabilities are brought together to work in collaboration with private and public partners to address both immediate and future needs. Research will be translated into tangible solutions for industry that help create an attractive business environment, maximize the contribution of key industry sectors to the economy and support long-term growth.

Planning Highlights:

- The aerospace industry is highly R&D intensive with annual spending of approximately $1.4 billion. An ever-increasing pressure on this sector is the need to become more "green" and apply innovative technologies to reduce both costs and reduce the environmental footprint. NRC will therefore focus efforts on advances in alternative fuels, light-weight materials, aerodynamic designs, and performance efficiencies. One project in 2011-12 will develop advanced coatings for high temperature aircraft engines and advanced thermal spray coatings to apply to gears. These coatings, to be developed in collaboration with industry partners, will allow engines to burn fuel at considerably higher temperatures leading to cleaner and more efficient combustion, thus decreasing fuel use. NRC will also provide technical services at the Global Aerospace Centre for Icing and Environmental Research (GLACIER) in Manitoba. As part of GLACIER (a joint venture between Rolls-Royce Canada Limited and Pratt & Whitney), NRC will partner with the Canadian Environmental Test Research and Education Center (CanETREC) to support testing, certification, and technology development for advanced aerospace designs. Finally, in 2011-12, work will continue on a cross-NRC initiative in alternative aviation fuels, one area of collaboration with the National Aeronautics and Space Administration (NASA).

- Canada's core strengths in auto-related innovation include advanced materials, design, visualization, manufacturing, and communications technology. To foster Canada's innovative capabilities, NRC will strengthen the role of Canadian companies by conducting and supporting technology development in light-weight materials and bio-composites as well as alternative propulsion systems. For example, NRC will work on the development of long-fibre thermoplastic composites, the latest technology in the manufacturing of non-metal composite (i.e. plastic) materials. When incorporated into vehicles, these lighter materials enhance fuel efficiency as well as durability, leading to reduced wear and increased safety for drivers and passengers. Also in 2011-12, NRC will help to commercialize Canadian electric vehicle technologies through a 2010 memorandum of understanding between NRC and China's Jiangsu Aoxin New Energy Automobile Co., Ltd. (Aoxin). The international partnership is expected to work towards the more than one million highway-capable, plug-in electric vehicles and hybrid-electric vehicles estimated to be on Canadian roads by 2018 and the $23-$60 billion estimated market in China for electric vehicle batteries by 2030. NRC is aligned with and will contribute to the federal initiative "Automotive Partnership Canada".

- The Canadian construction industry faces a new demand for environmentally-friendly, "green construction" technologies. This includes novel building materials, increased energy efficiency, and improvements to the indoor environment. NRC's R&D activities will focus on the use of bio-materials in residential and commercial buildings, as well as intelligent sensor systems controlling light, ventilation, heating and air conditioning systems in order to minimize energy use without decreasing indoor comfort. A special indoor environment program will continue to focus on improving air quality. NRC also plays a national leadership role in the development of model building, energy, fire, and plumbing codes for the safety of all Canadians. In 2011-12, NRC will focus on the rapid dissemination of the new National Model Construction Codes to stakeholders across the country.

Benefits to Canadians:

Canada's aerospace industry is the fifth largest in the world with total revenues over $22.2 billion in 2009. It directly accounts for 79,000 jobs and indirectly for an additional 150,000 across Canada. The Canadian

automotive industry is the world's third-largest exporter of automotive products and accounts for 16 per cent of North American vehicle production. Construction is one of Canada's largest industry sectors contributing $69 billion to overall GDP (12.6 per cent). These major industry sectors contribute to national productivity, job creation, wealth, and prosperity. Innovation, and the development and adoption of new technologies are crucial to ensuring that these sectors continue to be successful and globally competitive. NRC's plans and priorities in this program activity are intended to make strides in "green" manufacturing technologies and increase innovation capacities. Further, Canadian manufacturing SMEs are seeking market-oriented innovations but have limited capacity to invest in R&D. NRC's nationwide capability allows it to conduct research to meet the R&D needs of SMEs across Canada. Domestic suppliers offering technology solutions will be better connected to multinational assemblers, thus strengthening their viability in a highly competitive global market.

The general public will benefit from safer, more efficient, and more environmentally-friendly products and services that offer better value for money. Advances in construction technologies will make homes and industrial facilities energy- and water-efficient, while improving indoor air quality will bring benefits to Canadians – particularly those with respiratory diseases, which account for 9.5 per cent of all health care expenditures in Canada[15].

Program Activity – Information and Communications Technologies (ICT) and Emerging Technologies	
Expected Result: Advancements in innovative technology solutions in emerging and ICT sectors	
Performance Indicator: Revenue from service contracts and successful Intellectual Property (IP) transferred to emerging industry sectors	**Target:** $2.0M by March 2012[16]
Performance Indicator: Percentage of clients reporting positively on the impact of NRC R&D on client growth	**Target:** 85% by March 2012

Financial Resources ($ millions)			Human Resources (Full-time Equivalents)		
2011-12	**2012-13**	**2013-14**	**2011-12**	**2012-13**	**2013-14**
69.534	40.223[17]	40.364	396	233	233

ICT and emerging technologies are becoming pervasive, enabling other technologies that significantly contribute to Canada's global competitiveness and economic development. ICT, in particular, is a critical enabler of growth, trade and commerce, travel and global connectivity, value creation, and productivity.

NRC enables Canada's digital advantage by developing and deploying innovative technologies for industry. In today's world of large volumes of raw data, there is an urgent need to develop tools that convert data into usable knowledge. Enhancing productivity requires rapid extraction of real world information and representing it in meaningful and useful ways – whether through 3D visualization, virtual or augmented reality, or text, video or voice applications. Through its focus on data and text mining, as well as information capture and storage techniques, NRC simplifies the analysis, interpretation and extrapolation of essential data to assist in decision-making and knowledge discovery. NRC makes a major contribution to the Canadian ICT sector through three targeted activities: mission-oriented R&D across Canada, two community-based cluster initiatives (the Canadian Photonics Fabrication Centre in Ottawa and the IT and e-business cluster in New Brunswick) and through NRC-IRAP.

Planning Highlights:

[15] Canadian Institute for Health Information, 2004

[16] Target and date were advanced to 2012 as the PAA target was out of date.

[17] The difference between FY11-12 and FY12-13 is due to the Technology Clusters Initiative program, which is up for renewal in March 2012.

- NRC aims to initiate and coordinate industry-driven, multi-disciplinary research projects that leverage NRC's ICT technology platforms: electronic and photonics materials, devices and systems; communication technology; knowledge from data; and the information/society interface. For example, NRC will develop sensor networks to monitor and control indoor environments. The ultimate goal is an intelligent management system that will tailor the delivery of building services including lighting, temperature and ventilation to personal preferences, as well as monitoring and responding cost-effectively to pollutants such as formaldehyde, benzene, and radon. The system overall will improve decision-making processes leading to greater energy efficiency, a healthier indoor environment, lower maintenance costs, and effective integration with future Smart Grid technologies.

- The Canadian Photonics Fabrication Centre (NRC-CPFC), founded in 2001 by NRC in partnership with Carleton University and the Province of Ontario, supports the growth of photonics in emerging ICT markets by providing world-class engineering and manufacturing assistance, commercial grade foundry services, and pilot-run production facilities to develop and fabricate materials, devices, components, and systems. In 2011-12, NRC-CPFC will add to its suite of services to keep its clients at the leading edge of nanofabrication techniques, recognizing the opportunities that will flow from the convergence of nanotechnology, biology, and photonics. Its services significantly lower the risk and barriers of entry to emerging ICT markets for SMEs in Canada. NRC-CPFC will also provide access to, and training on, state-of-the-art design and manufacturing facilities to university researchers and students to ensure a larger pool of HQP for Canadian industry. To continue to facilitate the commercialization of future photonics-enabled products, the Ottawa Photonics cluster plans to use its technological expertise and extended networks with instrument suppliers to test new generations of fabrication tools that may increase the competitiveness of its stakeholders.

- Nanotechnology is an emerging technology that will be transformative and pervasive, enabling new products, new processes, and new materials in all Canadian sectors. Globally, the field of nanotechnology is undergoing a shift from discovery to innovation, with increased emphasis on the rising quality of basic nanomaterials as a platform for enhancing existing products and developing new ones in sectors such as electronics and transportation. NRC supports industry in Canada by continuing to work on nanoscience R&D projects related to ICT, energy, and environmental applications as well as developing the metrology that will support the manufacturing and global competitiveness of Canadian nano-based products. NRC will build on successes in these areas and engage industry receptors who can take these innovations to market.

Benefits to Canadians:

Emerging technology sectors are synonymous with innovation, wealth creation and increasingly, quality of life. For example, ICT industries are among the largest performers of private sector R&D. In 2009, ICT sector R&D expenditures were $6.2 billion, representing 38 per cent of total Canadian private sector R&D expenditures. The worldwide ICT total industry revenue is expected to climb to nearly $7 trillion by 2017, with growth rates in the 8-10 per cent range. Recognized as a critical industry for Canada, the GoC is developing a Digital Economy Strategy for Canada. Priorities such as business adoption of digital technologies to boost productivity and enabling Canadian companies to supply digital technologies to the world, are anticipated priority areas that the government will focus on to create a "digital" Canada. The plans and priorities of this program activity seek to contribute to federal priorities. NRC's activities will train and attract HQP within this sector, while advancing the state of photonics, emerging nano-based technologies, systems and digital content and its underlying infrastructure. The result will be novel applications brought to market, increasing the growth and productivity of Canadian ICT firms.

Program Activity – Industrial Research Assistance

Expected Result: SMEs in Canada have merit-based access to effective and efficient innovation support resulting in increased wealth

Performance Indicator: Average return in dollars to the Canadian economy (i.e. wealth creation in terms of increased sales and decreased cost) per dollar of Program cost	**Target:** 7 by March 2013
Performance Indicator: Number of SMEs financially supported	**Target:** 600 by March 2012
Performance Indicator: Number of jobs financially supported	**Target:** 2,500 by March 2012

Financial Resources ($ millions)			Human Resources (Full-time Equivalents)		
2011-12	**2012-13**	**2013-14**	**2011-12**	**2012-13**	**2013-14**
139.146	134.013	134.601	374	356	356

An innovative society is an entrepreneurial society. Indeed, Canada's business environment is composed of 99.8 per cent SMEs and is a major force in [11] Canadian growth and prosperity. However, growth can be difficult for SMEs due to a multitude of contributing factors including business risk, lack of funding to move from research to development to commercialization, and challenges in accessing international markets, to name a few. Barriers to innovation vary by industry and market, translating into the need for tailored advisory services in addition to financial support for R&D that is critical to SME growth.

As Canada's largest federal research and technology organization, NRC plays a key role in helping to move innovations to market. By virtue of its positioning, NRC has a strong relationship with various industry sectors, nationally and internationally. This provides an avenue to gather timely intelligence on market forces and provide financial assistance in critical technology areas. For more than 60 years, NRC-IRAP has adapted and redefined itself to meet the needs of Canadian SMEs for technical and business advisory services as well as financial assistance along the innovation process. NRC-IRAP has a growing international reputation and has been identified as a global best practice in providing innovation support to Canadian SMEs. With a broad suite of innovation services, NRC-IRAP is able to customize its offerings to help SMEs prepare for the future.

Planning Highlights:

- NRC-IRAP will help Canadian SMEs successfully commercialize technologies through the provision of technical and business advisory services and funding to support their R&D and other innovation-related activities. Efforts will continue to increase SME access to needed services, to encourage collaborations with other programs, organizations and levels of government, and to build effective regional/community innovation system (e.g. [12] NRC Technology Cluster) relationships and services that benefit all SMEs.

- In 2011-12, NRC-IRAP will focus on improving performance management and reporting. Key projects will look at enhancing information management/information technology infrastructure and reporting processes as well as introducing service standards. This will ensure that program impacts continue to be in line with departmental and federal accountability requirements, including those for federal transfer payment programs, and that benefits to Canada are clearly demonstrated. NRC-IRAP will continue to measure and track the impact of its activities on Canadian SMEs and the Canadian economy.

- Through continuous operational and technological improvements, NRC-IRAP will increase the efficiency and effectiveness of its program delivery. NRC-IRAP will continue to make every effort to streamline due diligence and monitoring processes in order to allow its Industrial Technology Advisors to focus their expertise on serving the largest number of clients possible. These improvements will be carefully managed to ensure that increased process efficiencies does not come at the expense of the screening rigour required to ensure that NRC-IRAP funds continue to be invested wisely.

Benefits to Canadians:

Through the three priorities above, Canadians will benefit from stronger, larger, and more innovative SMEs, increased commercial success of products and services developed by SMEs, more employment of HQP,

increased operational cost-efficiencies within NRC-IRAP, and a high-level of program accountability. Through the support to SMEs, this program activity is clearly aligned with the GoC's priorities to provide economic benefits and value for money to Canadians and to position Canada among the world's most innovative countries. Since SMEs in Canada account for 99.8 per cent of businesses and employ one in every six Canadians, their success is critical for Canada's productivity growth which, in turn, leads to long-term economic prosperity and social well-being.

Program Activity – Health and Life Science Technologies					
Expected Result: Canadian health and life science industries have greater access to effective and innovative technology solutions					
Performance Indicator: Revenue from successful IP transferred to Health & Life Science industries			**Target:** $5M by March 2012		
Performance Indicator: Percentage of respondents from the health and life science industrial collaborators who respond positively on value of NRC innovative contributions			**Target:** 85% by March 2012		
Financial Resources ($ millions)			**Human Resources (Full-time Equivalents)**		
2011-12	**2012-13**	**2013-14**	**2011-12**	**2012-13**	**2013-14**
92.829	81.652[18]	82.172	695	622	622

Canadians are increasingly concerned about their health and access to care. One underlying issue is the financial sustainability of the health care system. Total costs are estimated to be $191.6 billion in 2010, representing [13] 11.7 per cent of GDP. Furthermore, changing demographics and a growing global population are expected to have an impact on health care costs, demand, and access. For example, although Canada's population in 2005 was younger than that of most G8 countries, it is expected to age more rapidly in the coming years as a direct result of the baby boom following the Second World War. By 2031, seniors are anticipated to comprise [14] between 23 and 25 per cent of our total population. By 2050 the global population is expected to reach 9 to10 billion people. Such changes will have an impact not only on our health system but also on our standard of living. For example, global food requirements are expected to double but with less arable land, water, and fertilizer.

NRC is positioned to help tackle these substantial issues by working with partners across industry, government, and academia, bringing a multi-disciplinary and integrated focus to the development of timely and cost-effective solutions. NRC has world-class competencies across Canada in the life sciences field that can be leveraged to develop and bring to market integrated approaches to improve health care, reduce health care costs, and increase agricultural productivity and food security.

Planning Highlights:

- NRC will continue to leverage its unique-to-Canada technology platforms and deep expertise by partnering with Canadian companies to bring to market innovative biologics-based therapies, targeted therapies, and theranostic products (drug-diagnostic combinations). Target diseases in the areas of cancer, neurodegenerative, and inflammatory disease, reflect NRC's own core competencies and competitive advantages in antibody development and the suitability of antibody therapeutics for these disease areas. In addition, NRC will begin to leverage its expertise in imaging, in analytic chemistry, genomics, proteomics, and bioinformatics to develop companion diagnostic tests, which can be incorporated into full clinical theranostic products for use by biopharmaceutical companies to save time and money in their internal drug development programs. Increased emphasis will be placed on integrated technological solutions for our aging population. NRC will begin to develop immunological solutions for delivery of vaccine and immune therapies for those most at risk in an aging society.

[18] The difference between FY11-12 and FY12-13 is due to the Technology Clusters Initiative program, which is up for renewal in March 2012.

Progress is planned in areas such as novel adjuvants, antigen targets and the development of nasal/oral immunization to target mucosal immunity (particularly important for the elderly). Such a focus will help address the two critical challenges facing Canadian biopharmaceutical companies: the lack of access to key platform technologies and the lack of access to risk capital for drug discovery (the latter, by reducing the risk of early stage discoveries and improving the viability and valuation of therapeutic leads). Finally, in 2011-12, NRC will follow on with planned international engagement in life sciences, including a workshop on vaccines with Chinese and Canadian researchers, to be held in China.

- Using its expertise in magnetic resonance, medical photonics, and IT-based decision support systems, NRC will continue to develop new instrumental techniques and associated software for minimally invasive medical diagnosis, transfer these techniques to clinical use, and be a major driving force in the Canadian medical device sector. In Winnipeg, NRC's Biomedical Cluster will focus on helping the community develop into a highly productive Canadian centre of biomedical device technology by accelerating biomedical technology commercialization. For regional SMEs, NRC will provide business coaching, mentoring and technology services, and information research and analysis.
- Through NRC's tripartite relationship with Agriculture and Agri-Food Canada and the University of Prince Edward Island, NRC will continue to provide chemical and biological technologies to support the development of evidence-based science in support of health claims for functional foods and natural health products that play an important role for consumers in the prevention of chronic disease. By contributing to prevention, NRC will contribute to health care savings. These same efforts will enable NRC to deliver on its Charlottetown cluster objectives of helping Canadian companies seize larger opportunities in the nearly $300 billion global market for nutrition-related products.
- NRC will continue to work with other key stakeholders in the value chain to ensure the prosperity of Canadian farmers and the broader agriculture industry in the face of increasing competition and environmental changes. By doing so, NRC will be aligned with the GoC's and NRC's strategic priorities with respect to food security and resource sustainability. Over the next five years, NRC will continue to use its unique multidisciplinary capabilities in genomics and technology platforms to double the average productivity gain of targeted crops such as canola, flax, and other pulse crops. As part of the Saskatoon cluster, NRC will continue to work with commodity-crop consortia by providing the technology platform support required to increase yield, reduce input cost and adapt crops to climate/environmental stresses.

Benefits to Canadians:

NRC's Health and Life Sciences program activity focuses on the health of Canadians and the growth of key industrial sectors. To best address the needs of our aging population and increasing health care costs, NRC efforts are geared towards prevention, early diagnosis, and cost-effective treatments. Knowledge and technology developed from our activities will be commercially exploited to ensure a positive impact on the health and wellness of Canadians and to support a thriving health care sector. Such activities will also support the growth of Canadian pharmaceutical, medical device, and nutraceutical/functional food companies by helping to reduce the financial risks associated with early stage discoveries and improving the viability and valuation of therapeutic leads.

Our life sciences expertise in agriculture will address the growing global and domestic food requirement. NRC's plans and priorities will focus on supporting Canada's agriculture sector, thus enabling us to maintain our export position and contribution to GDP, currently in the range of [15] $87.9 billion (8.8 per cent) per year.

Program Activity – Energy and Environmental Technologies

Expected Result: Collaborative contributions on improving sustainability of Canada's natural resources and protection of Canada's environment through innovation

Performance Indicator: Percentage of responding collaborators who respond positively on the value of NRC contributions to natural resource sustainability and environmental protection innovations	**Target:** 85% by March 2012

Financial Resources ($ millions)			Human Resources (Full-time Equivalents)		
2011-12	**2012-13**	**2013-14**	**2011-12**	**2012-13**	**2013-14**
34.633	27.995[19]	28.137	295	246	246

To maintain our standard of living and well-being, Canada must address the critical challenges faced in environmental sustainability and climate change. The issues are well known: air quality, water quality and availability, and the protection of our natural resources. For over 20 years now, sustainable development has been promoted as a means of bridging economic and ecological goals. The journey toward truly sustainable development and decision-making has become a key foundation of public policy here at home and around the globe. Developing technologies that lead to sustainability is about safeguarding Canada's future and improving the quality of life for Canadians.

NRC is collaborating and partnering with other governments, industry and universities – combining strengths and capacities through a multidisciplinary, internationally collaborative approach – to build the critical mass needed to address sustainability challenges and support national needs. This program activity combines efforts from across NRC to address clean energy, climate change, and the "green" needs of industry and society. NRC will focus on technology development aligned with federal S&T Strategy priorities and other government initiatives – in particular, complementary initiatives at Natural Resources Canada. Several initiatives are planned for 2011-12, some of which are outlined under other program activities. These include energy conversion and storage, energy efficiency, green buildings, water quality, and sustainable agriculture.

Planning Highlights:

- The world is moving to low-carbon clean energy, driven by increasing concern over climate change and energy security. A key component of the fast-changing energy landscape is energy generation including bio-renewables, wind, and solar. A sustainable economy relies on sustainable sources of renewable goods, to create products with a reduced carbon footprint, thereby creating economic value and protecting the environment at the same time. With abundant biological resources (forests, agricultural, and aquatic ecosystems), Canada is well positioned to convert its biomass, not just to provide food, feed, and fibre, but also into energy, chemicals and other materials. To contribute to Canada's bioeconomy, NRC will continue its efforts to: develop chemicals such as ethanol from lignocellulosic materials; develop sustainable industrial eco-materials, biopolyols and biopolymers from renewable resources; develop transformative pathways to convert waste biomass to high value products such as energy and chemicals; and use the biorefinery approach to convert industrially produced carbon dioxide (CO_2) to renewable algal biomass, to in turn provide biofuels, chemicals, and other commercial products.
- NRC is a strong player in the R&D of advanced energy storage technologies, addressing Canada's innovation needs by responding to market pull across the value chain. This value chain spans raw materials, specialty chemicals and materials, device producers, original equipment manufacturers and device integrators, specialty applications, broad scale applications, and recyclers. NRC will provide a one-stop portal to industry for technical support during the development and manufacturing of energy storage technologies by providing consultation services, collaborative R&D, fee-for-service work, technology transfer, and by participating in consortia for technology leadership, mapping and collaboration. NRC will develop the safety and performance standards of energy storage technologies, while reducing the cost in order to address broader markets. NRC's range of expertise and its established networks of collaborators will enable it to address key technical problems as well as optimize power distribution efficiency through integrated solutions that include sensor systems, smart metering, and decision software.

[19] The difference between FY11-12 and FY12-13 is due to the Technology Clusters Initiative program, which is up for renewal in March 2012.

- Another priority for NRC is water sustainability and quality. Canada's population is expected to increase by 25 per cent by 2050 and the changing climate is anticipated to increase temperatures, change precipitation patterns, and increase the frequency of extreme weather events such as floods and droughts. These stresses are anticipated to affect national watersheds, water quality and create new pressures on the [16] long-term sustainability of water resources. To address water sustainability, NRC will develop green manufacturing processes that require less water than traditional processes, involving technologies such as the use of biocatalysts, green chemicals, and low temperature microbial systems. To improve water quality, NRC will continue to develop micro-arrays, bio-assays, and biosensors to track and detect pathogens and other microorganisms in drinking water sources, including surface and groundwater. Water management and sustainability (as well as renewable energy in both solar and biofuel areas) are expected topics of continued discussion at the second Canada-Israel Innovation Roundtable in 2011.

Benefits to Canadians:

Canadians face a delicate balance between environmental issues and economic and social considerations. A large proportion of Canada's economic output is exported, and 40 per cent of those exports are energy-intensive, resource-based commodities such as oil and natural gas[20]. Innovative technologies are a key input in support of ensuring long-term sustainable progress on the integrity of Canada's environment and resources, while also ensuring a strong economy and the general well-being of Canadians. Pressures to deal with rising energy demands and costs and climate change all provide opportunities for future innovation in clean and sustainable technology. The global shift towards technology development to address the environment and protect our natural resources will benefit our country and our standard of living while creating opportunities for economic growth.

NRC is well positioned to play an important role in supporting environmental and social integrity, while in parallel supporting Canadian firms in their quest to succeed in global markets. NRC's structure and extensive networks combine nation-wide technical excellence with the ability to provide industrial support at the provincial, municipal and remote community levels. NRC will play a vital role in the deployment of technologies across several value chains, triggering economic activity that will support an increase in the global reach of Canadian firms and the reduction of green house gas emissions as a net result.

2.2 NRC Strategic Outcome 2

Canadians have access to research and development information and infrastructure

NRC plays a vital role in Canada's innovation system by providing, maintaining, and advancing national infrastructure and standards. Through NRC, Canadian firms can access an array of national facilities and programs designed to help them conduct fundamental research as well as take new products and technologies to market. As part of NRC's mandate, the National Science and Technology Infrastructure Program operates and administers national astronomical observatories in addition to maintaining measurement standards in support of domestic and international trade. The Scientific, Technical and Medical Information Program provides access to scientific and medical information, a fundamental requirement for achieving an innovative and knowledge-based economy.

Descriptions to all program activities falling under this Strategic Outcome can be found on [17] Treasury Board Secretariat's web site.

Program Activity – National Science and Technology Infrastructure	
Expected Result: Canada's national science and technology facilities are up-to-date and accessible to Canadians in accordance with federally legislated and assigned mandate and/or evolving national needs	
Performance Indicator: Percentage of surveyed clients reporting positively on their perceived value of NRC R&D infrastructure used	**Target:** 85% by March 2012

[20] Environment Canada, 2007

Performance Indicator: Number of Canadian users of major NRC science infrastructure	**Target:** 1,200 by March 2012

Financial Resources ($ millions)			Human Resources (Full-time Equivalents)		
2011-12	**2012-13**	**2013-14**	**2011-12**	**2012-13**	**2013-14**
91.954	91.733	92.144	284	284	284

NRC provides critical S&T infrastructure to support Canadian excellence in R&D, for today and into the future. NRC will continue to work with academic, industry and government partners to ensure that national S&T facilities remain up-to-date and accessible to Canadians in accordance with its federally legislated and assigned mandate and/or evolving national needs.

Planning Highlights:

- NRC will meet the current and future needs of Canadians in the areas of primary measurement standards and calibration and measurement capabilities through its mandated National Measurement Standards initiative, which provides the traceability of measurements and impacts directly on the ability of Canadian firms to trade internationally. As part of this activity, NRC will develop measurement standards for emerging technologies such as nanotechnology, ensuring that Canadian industry can manufacture and have access to existing and new global markets. NRC will continue to support national and global trade interests by strengthening participation in international metrology activities.
- As part of NRC's mandate of "operating and administering any astronomical observatories established or maintained by the Government of Canada", NRC provides access to primary international state-of-the-art telescopes for Canadian scientists, as well as to astronomical data that are collected and distributed by the NRC's Canadian Astronomy Data Centre. Canada's astronomy community is in the process of finalizing its long-range plan for astronomy, outlining priorities for both ground-based and space-based facilities and projects. NRC looks forward to the publication of this community-developed roadmap, together with the results of the Study of Canadian Astronomy undertaken in 2010 by NRC, as these documents will provide the GoC with the information needed to make informed decisions on the future of Canada's astronomy program. The Atacama Large Millimetre Array (ALMA), an array of 62 sub-millimetre antennas, will launch full operations in 2011 while the Square Kilometre Array (SKA), a next-generation radio telescope array, continues to be in the preparatory phase. NRC will continue to contribute to the full range of ground-based observatories, including creating leading-edge instrumentation for the facilities in collaboration with Canadian industrial partners.
- The NRC Canadian Neutron Beam Centre (NRC-CNBC) is a unique facility in Canada, enabling neutron beam experiments to be undertaken on behalf of universities, industry and government researchers across Canada and internationally. The Centre is one of about 20 similar neutron scattering facilities worldwide and a key part of Canada's science infrastructure. NRC-CNBC provides support to over 50 departments from 20 universities and to over 100 foreign institutions each year, training HQP from across Canada. CNBC will continue to support the aerospace, automotive, rail and electronics sectors by applying neutron analysis to nano-structured and other materials.
- TRIUMF, Canada's national laboratory for particle and nuclear physics, is owned and operated as a joint venture by a consortium of 11 Canadian universities. The core operating budget is supported via a Contribution Agreement through NRC, with additional support from tri-council funding agencies, the Canada Foundation for Innovation, and the Government of British Columbia. During the 2010-15 period, TRIUMF will:
  - Begin construction on a superconducting electron linear accelerator (e-linac), to produce isotopes. Together with the main cyclotron at TRIUMF, the e-linac when completed in 2014 will offer Canada global leadership in the production and study of isotopes for physics and medicine.
  - Lead efforts, in collaboration with universities across Canada, to tease out the mechanism by which particles gain mass in the Standard Model of Particle Physics. TRIUMF provides technical, engineering and computing resources to the Canadian community of nearly 200 researchers and

students to exploit the data from the ATLAS detector at the Large Hadron Collider in Switzerland – the world's largest scientific project.

- Work with the BC Cancer Agency and the Pacific Parkinson's Research Centre to develop new imaging agents for identifying amyloid plaques associated with Alzheimer's Disease, stress chemicals associated with the onset of diabetes, and biochemical features of cancerous tumours, that would predict which treatment regimens will be most successful.

Benefits to Canadians:

NRC has a role in ensuring a long-term vision for Canada in the development of leading-edge science and technology. Through NRC, Canadian user communities access an array of national facilities and programs designed to allow them to conduct frontier scientific research. In addition, NRC develops the measurement standards that allow these scientific innovations to be commercialized. There are several specific intended program benefits.

- The increasing globalization of trade has made metrology and the establishment of national measurement standards a key element for export-dependent economies such as Canada. NRC plays a vital role in assuring global market access to Canadian industry by reducing non-tariff trade barriers. As emerging technologies are commercialized, metrology and standards will be a key enabler, making process controls and repeatable results possible.
- NRC's research in astronomy enables Canada to attract HQP to its science programs and creates opportunities for Canadian industry to participate in contracts related to large-scale science infrastructure. These benefits are achieved by Canada's participation in international facilities, in collaboration with partners from other nations.
- TRIUMF provides world-class facilities for researchers across Canada in the areas of subatomic physics, life sciences, nuclear medicine and materials science. R&D in these areas will contribute to a better quality of life for Canadians particularly in areas focused on medical applications.

Program Activity – Scientific, Technical and Medical Information

Expected Result: High value information that advances research and innovation in the areas of science, technology and health/medicine

Performance Indicator: Percentage of clients who reported that NRC Canada Institute for Scientific and Technical Information (NRC-CISTI) information services contributed to advancing their research and development, technology commercialization or planning and decision-making.	**Target:** 85% by March 2014

Financial Resources ($ millions)			Human Resources (Full-time Equivalents)		
2011-12	**2012-13**	**2013-14**	**2011-12**	**2012-13**	**2013-14**
13.209	13.080	13.253	90	90	90

This program activity responds to three interlinked issues: providing the most relevant information to support the R&D of technology solutions and their deployment to industry; making research outputs accessible to increase their value; and finding efficiencies in providing library services within government. Scientific, technical and medical/health (STM) information is essential to the R&D process. Researchers are spending more time searching for relevant information as the volume of electronic content steadily increases. NRC provides efficient and effective tools and services to get to the most relevant information in all areas of national importance. Canadian taxpayers are increasingly concerned with seeing the results of their investment in science, and NRC is making Canadian research outputs, including published results and data sets, more accessible through vehicles such as the NRC Publications Archive.

Planning Highlights:

- NRC will provide a full spectrum of information services to support NRC research decisions, industry collaborations, SMEs via NRC-IRAP, and successful technology transfer to the private sector for commercialization. Services will range from online tools to find information quickly, to in-depth reports that filter, analyze and synthesize information from multiple sources for added value. The national science library collection will continue to be accessible to all Canadians through this program activity.
- NRC will make publicly funded research results freely accessible to increase the return on investment for research and development funded by the federal government. In 2011-12, the [18] NRC Publications Archive (NPArC) and [19] PubMed Central Canada (PMC Canada) will continue to be enhanced. The NRC Publications Archive is a publicly accessible online repository of over 35,000 publication records and over 5,000 full-text NRC-authored publications. PMC Canada is a full-text peer-reviewed health and life sciences database built and run in collaboration with the Canadian Institutes of Health Research (CIHR) and the U.S. National Library of Medicine (NLM). A registration service for data sets will be established to make them more easily accessible by providing a means to link them to published articles and other research outputs and through searchable metadata.
- NRC will implement library services in collaboration with other science-based departments and agencies. Participating departments will be able to select from a portfolio of six library-related services (e.g. acquisitions and cataloguing) to be provided by NRC-CISTI, while continuing to provide subject specialized information services for their own clients. This will optimize resources and allow participating departments and agencies to concentrate on their core strategic activities.

Benefits to Canadians:

Canadians benefit from an effective R&D process and the successful deployment and commercialization of technology solutions in areas of national importance. This program activity is critical to providing timely and relevant information to Canadian researchers and entrepreneurs – information that supports research activities and contributes to the efficient use of research funds. The return on federal research investment is increased when research outputs are made available to current and future generations of Canadian researchers as a basis for further discovery and innovation. Offering NRC Library Services to other government departments allows resource utilization to be optimized through economies of scale and sharing of expertise, while providing improved, streamlined service delivery. Canadians benefit from the reduction in overall costs and the increase in effectiveness of federal library expenditures.

2.3 Internal Services

Description of internal services can be found on [20] Treasury Board Secretariat's web site.

Financial Resources ($ millions)		
2011-12	2012-13	2013-14
122.980	117.954	119.561

Human Resources (Full-time Equivalents)		
2011-12	2012-13	2013-14
625	620	620

Planning Highlights:

The year 2011-12 will be a pivotal year for NRC as we embark upon a new organizational strategy. This strategy defines the strengths of NRC, focusing programs in areas where NRC can differentiate and make compelling impacts to federal S&T priority areas. Through the transition, NRC will implement a five-year plan with clearly defined priorities and performance commitments each year that will put NRC on track to reach its desired end state. Underpinning NRC's success will be sound business practices that will support the needs of programs, activities and operations. Specifically in 2011-12, internal service priorities will be based upon key guiding principles: focus; sustainability; communication; and shared values.

- Business and Financial Management:
  As the organization seeks longer-term sustainability derived from a more focused direction, NRC will

implement specific measures in 2011-12 to support programs as they align to the new strategy. New business models will be put in place to support client needs, collaborations and partnerships, and to support sustainable increases in income generation. To manage the transition to new models, plans with financial and operational targets will be launched and progress will be assessed through NRC's business intelligence management system. Performance dashboards will be designed to support ongoing variance analyses and executive decision-making. New financial forecasting methodologies and analyses of trends and future projections will also be implemented. Furthermore, various business processes will be streamlined and/or augmented in order to strengthen program support, increase operational efficiencies, and reduce overhead.

- Communication:
  NRC will continue the integration of communications and marketing with its business priorities in order to better connect with Canadian industry. It will raise awareness and use of its products and services through targeted marketing activities and the establishment of a strong and credible brand that will be championed throughout the organization. It will also focus on establishing a stronger media presence by presenting its stories in ways that highlight their relevance to Canadians, and by developing the most efficient vehicles to increase and improve NRC's presence in traditional and social media outlets.
- International Relations:
  NRC will use its strong international reputation to continue developing mutually beneficial relationships with organizations abroad. NRC will undertake international engagement to enable Canada's global competitiveness where it makes sense for the effective operation of its business lines and to fulfill Canadian priorities with targeted economies. A critical part of building NRC's international advantage will be helping companies in Canada access global value chains.
- Client Focus and Management:
  NRC will focus on strategies that will allow us to achieve intended long-term impacts for our clients, such as increased business enterprise expenditure on R&D (BERD). Specific initiatives will include incorporating tools to facilitate client interactions, providing expert advice on intellectual property management, and ensuring complex business agreements are negotiated in a manner to meet the needs of clients. NRC will also steer a number of initiatives that promise to speed our ability to react to business opportunities in targeted client segments. Chief among these will be the exploration of a new client relationship management (CRM) system and approach. The CRM is intended to help NRC coordinate client activities and provide clients with better service and more integrated and broader offerings. Also in 2011-12, NRC will focus on a corporate business training and orientation program, NRC Business Advantage, which aims at raising NRC's level of business and client management practices as well as advancing common solutions to new innovation and business communications models.
- Human Resource Management:
  In 2011-12, NRC will continue its commitment to the newly formed NRC values, by providing training to managers and leaders in values-engagement across NRC and by aligning HR initiatives to create a shared value system. Moving forward, NRC's values, which will dovetail with the anticipated federal government's Public Service Code of Conduct, will resonate throughout our programs, initiatives and business plans. An assessment of the values integration will take place in 2012-13. To recruit and retain HQP, resources will be dedicated to initiatives focusing on talent attraction, selection, and management. A review of NRC's recruitment activities and hiring policy, and the establishment of a shared services hiring model (to be implemented through 2011-12) will focus on effectiveness and efficiency as well as overall candidate care, and will result in specialized expertise in sourcing and recruitment. To engage and train current HQP, efforts will continue on management training, developing talent, and building leadership capacity at all levels. Specifically, the Commitment to Excellence program (NRC's new program for planning, enabling, and recognizing performance) will be launched and the third cycle of NRC's Leadership Enrichment and Development (LEAD) training program will commence.

Section III – Supplementary Information

3.1 Financial Highlights

The future-oriented financial highlights presented within this RPP are intended to serve as a general overview of NRC's financial position and operations. They are prepared on an accrual basis to strengthen accountability and improve transparency and financial management. More detailed future-oriented financial statements can be found on [21] NRC's Web site.

Future-oriented Condensed Statement of Operations For the Year (Ended March 31) ($ millions)	% change	Future-oriented 2011–12	Future-oriented 2010–11
Total Expenses	N/A	860.0	N/A
Total Revenues	N/A	160.0	N/A
Net Cost of Operations	N/A	700.0	N/A

3.2 List of Supplementary Tables

The following tables are located on [22] Treasury Board Secretariat's web site.

- Details on Transfer Payment Programs (TPPs)
- Greening Government Operations
- Horizontal Initiatives
- Upcoming Internal Audits and Evaluations over the next three fiscal years
- Sources of Respendable and Non-Respendable Revenue
- Summary of Capital Spending by Program Activity

Section IV – Other Items of Interest

Online References

[*] This symbol denotes a reference to another section within this document.
[1] http://laws.justice.gc.ca/eng/N-15/index.html
[2] NRC's Main Estimates 2011-12 http://www.tbs-sct.gc.ca/est-pre/20112012/me-bpd/toc-tdm-eng.asp
[3] Government of Canada's Strategic Outcomes http://www.tbs-sct.gc.ca/ppg-cpr/frame-cadre-eng.aspx
[4] NRC's Main Estimates 2011-12 http://www.tbs-sct.gc.ca/est-pre/20112012/me-bpd/toc-tdm-eng.asp
[5] Government of Canada's Strategic Outcomes http://www.tbs-sct.gc.ca/ppg-cpr/frame-cadre-eng.aspx
[6] NRC's Main Estimates 2011-12 http://www.tbs-sct.gc.ca/est-pre/20112012/me-bpd/toc-tdm-eng.asp
[7] Government of Canada's Strategic Outcomes http://www.tbs-sct.gc.ca/ppg-cpr/frame-cadre-eng.aspx
[8] http://www.ic.gc.ca/eic/site/ic1.nsf/eng/00857.html
[9] NRC's Main Estimates 2011-12 http://www.tbs-sct.gc.ca/est-pre/20112012/me-bpd/toc-tdm-eng.asp
[10] NRC's Main Estimates 2011-12 http://www.tbs-sct.gc.ca/est-pre/20112012/me-bpd/toc-tdm-eng.asp
[11] Key Small Business Statistics July 2010 http://www.ic.gc.ca/eic/site/sbrp-rppe.nsf/eng/rd02493.html
[12] http://www.nrc-cnrc.gc.ca/eng/clusters/index.html
[13] National Health Care Expenditure Trends 1975-2010, CIHI at http://secure.cihi.ca/cihiweb/products/NHEX%20Trends%20Report%202010_final_ENG_web.pdf

[14] Statistics Canada Population Projections for Canada at
http://www.statcan.gc.ca/pub/91-520-x/00105/4095126-eng.htm
[15] http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1261159658146&lang=eng
[16] Changing Currents: Water Sustainability and the Future of Canada's Natural Resources, at:
http://www.nrtee-trnee.com/eng/publications/changing-currents/summary-changing-currents-eng.php
[17] NRC's Main Estimates 2011-12 http://www.tbs-sct.gc.ca/est-pre/20112012/me-bpd/toc-tdm-eng.asp
[18] http://nparc.cisti-icist.nrc-cnrc.gc.ca/npsi/jsp/nparc_ab.jsp
[19] http://cisti-icist.nrc-cnrc.gc.ca/eng/services/cisti/pubmed-central-canada/index.html
[20] NRC's Main Estimates 2011-12 http://www.tbs-sct.gc.ca/est-pre/20112012/me-bpd/toc-tdm-eng.asp
[21] http://www.nrc-cnrc.gc.ca/eng/reports/corporate-publications.html
[22] http://www.tbs-sct.gc.ca/rpp/2011-2012/info/info-eng.asp